REMARKS

In the Office Action, the Examiner objected to claim 13, rejected claim 1 under the first paragraph of section 112, rejected claims 1 – 8 and 13 as obvious over Kikushima in view of Mori, rejected claim 14 as obvious over Kikushima and Mori in view of Rife, indicated that claims 9 and 15 would be allowable and allowed claims 16 and 17.

Claim Objection

The claim 13 has been amended to correct an obvious error. The corrected claim provides antecedent basis for the claim terms.

35 U.S.C. §112, 1st ¶

Applicant respectfully disagrees with the Examiner's position that the heat dissipating element being disposed in a position to receive air flow on both sides is new matter. The present specification and drawings fully support this feature. For example, the specification repeatedly refers to the heat dissipating elements being positioned to be in the air flow. The introductory portion of the application contains such statements at page 1, line12; page 1, line 18; and page 2, line 1, specifically discussing the traditional heat sink structure. On page 3, line 14 and page 6, line 1, is provided statements that the present invention may use traditional heat sink structures as the heat dissipating element. Thus, the heat sink structures of the present invention may be positioned in the air flow.

On page 8, lines 15 and 16, the heat dissipating element is parallel and overlying the transistor, and is described as spaced from and lying over the transistor. Thus, air may flow is not only over but also under the heat dissipating element. On page 10, lines 18 and 19, the

heat dissipating element may be provided at a greater height from the board. Even greater air flow under the heat dissipating element is possible.

In the drawings, the heat dissipating element is shown spaced above the transistor with an air gap therebetween. The heat dissipating element extends above the circuit board and above the transistor, and there is a gap between the heat dissipating element, on the one hand, and the transistor and the circuit board, on the other hand. It is clear from the drawings that air is in contact with both sides of the heat dissipating element. The heat being dissipated by the heat dissipating element will cause the heated air to flow, and so air flows over both sides of the heat dissipating element.

Accordingly, the change made in the previous amendment is fully supported by the disclosure as filed, and no new matter was added thereby. Applicant respectfully requests withdrawal of the section 112 rejection.

35 U.S.C. §103(a)

Kikushima discloses a molded resin case that encloses a piezoelectric oscillator. Leads from a lead frame are provided in the molded case and extend out the sides of the molded case. Most of the leads are bent downward outside of the molded case to reach the circuit board and so provide electrical contacts for the oscillator, either as J leads or as Z shaped leads, for surface mounting. A few of the figures show short sections of the lead frame extending straight out of the molded housing, for example, at 12. These short lead sections are described as radiating leads. The extend from the sides of the molded component housing.

The Kikushima reference does not show a mounting plate under the heat generating molded component. Further, it does not disclose a heat dissipating element disposed above

the heat generating element, or spaced from the heat generating element in a direction perpendicular from the mounting plate. In Kikushima, heat generated by the oscillator is transferred on the leads to the sides of the molded case and for the most part to the circuit board on which the component is mounted. In the case of the leads 12, the heat is dissipated into the air along side the component.

By contrast, the present invention provides a heat dissipating element that carries heat from the mounting plane of the heat generating element to the an area spaced above the heat generating element. Greater air flow is provided in the space above the component. For purposed of the present remarks, the term "above" refers to the direction shown "above" the component in the figures, but this can be above, below or to the side when the present apparatus is actually mounted and in use in an electronic device, as is well understood by those of skill in the art.

The head dissipating element has a mounting plate between the heat generating element and the mounting surface. Further, the heat dissipating element has a portion spaced from both the circuit board and the heat generating component so that air can effectively cool the heat dissipating element, and thereby cool the heat generating component. The Kikushima reference does not disclose this combination of features.

The **Mori et al.** reference discloses bonding a resin sealed semiconductor device to a die pad with a resin film. The die pad has controlled spacing of the holes to prevent the resin from passing all the way through the holes.

By contrast, the present invention provides a mounting plate having holes therein and a quantity of solder or adhesive sufficient to not only pass all the way through the holes but also

to bond the surface below the mounting plate (the circuit board) to the surface above the mounting plate (the heat generating component). Nothing in Mori teaches bonding together surfaces above and below the perforated plate using adhesive that passes all the way through the holes.

There is no teaching or suggestion that would lead the person of ordinary skill in the art to combine the lead frame of Kikushima with the die pad of Mori. Even is such a combination was made, it would still not result in the combination of features claimed in the present application.

In claim 1, the heat dissipating element and the heat generating component are spaced from one another to permit air flow between the heat dissipating element and the heat generating component. Not even the combination of references suggests such feature.

The prior art does not show or suggest the feature claimed in claim 5 nor those claimed in claim 7.

Claim 13 provides that the heat dissipating element is spaced from the heat generating component in a direction perpendicular to a major surface of said heat generating component, which is not shown in the cited art.

The present invention as claimed is thus not shown or suggested in the prior art, and therefore is a non-obvious improvement thereover.

Allowed Claims

Applicant notes with appreciation the allowance of claims 16 and 17 and the indication that claims 9 and 15 are directed to allowable subject matter. Claims 9 and 15 have been redrafted in independent form.

New Claims

New claims 18, 19 and 20 are presented for consideration. The allowance of the new claims, and all claims under consideration is hereby requested.

Conclusion

Each issue raised in the action has been addressed. Early favorable reconsideration and allowance is hereby requested.

Respectfully submitted,

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CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in an envelope addressed to:

The Assistant Commissioner for Patents
Washington, D.C. 20231

on February 24, 2003.

VERSION MARKED TO SHOW CHANGES

The claims have been amended as follows:

1. (Twice Amended) A heat sink assembly, comprising:

a circuit board having a mounting pad provided with an adhesive material in a mounting region;

a mounting plate formed of a thermally conductive material and defining a plurality of adhesive flow openings therethrough, said mounting plate having a first major surface being positioned on said mounting pad of said circuit board;

a heat dissipation element thermally connected to said mounting plate and being spaced from said circuit board, said heat dissipating element being disposed in a position to receive air flow on both sides; and

a heat generating component mounted on said mounting plate at a second major surface opposite said first major surface, said heat dissipating element being spaced from said heat generating component to permit air flow between said heat dissipating element and said heat generating component.

9.(Amended) A heat sink assembly [as claimed in claim 1, further comprising:] , comprising:

a circuit board having a mounting pad provided with an adhesive material in a mounting region;

a mounting plate formed of a thermally conductive material and defining a plurality of adhesive flow openings therethrough, said mounting plate having a first major surface being positioned on said mounting pad of said circuit board;

a heat dissipation element thermally connected to said mounting plate and being spaced from said circuit board, said heat dissipating element being disposed in a position to receive air flow on both sides;

a heat generating component mounted on said mounting plate at a second major surface opposite said first major surface, and

a channel along an edge of said mounting plate, said channel receiving a tab extending from said heat generating component.

13.(Twice Amended) A heat sink for a surface mounted heat generating component, comprising:

a mounting plate of a generally planer configuration defining a plurality of openings therethrough for adhesive flow through said openings;

an extension member extending generally perpendicular to said mounting plate; and

a heat dissipation element connected to said extension member, said heat dissipation element and said extension member [surface] and said mounting plate being thermally conductive and said heat dissipating element being spaced from the heat generating component in a direction perpendicular to a major surface of said heat generating component.

14. (Amended) A surface mountable heat sink for a component, comprising:

a substantially planar mounting plate having an outer extent substantially a same shape and dimensions as a footprint of the component, said mounting plate defining openings extending therethrough;

a vertical portion extending at a substantially right angle from said mounting plate, said vertical portion having a first end at said mounting plate and a second end opposite said first end; and

a heat dissipating fin connected to said second end of said vertical portion, said heat dissipating fin having an extent in a direction substantially parallel to said mounting plate and space therefrom, said heat dissipating fin being spaced from the component in a direction perpendicular to said mounting plate when the component is mounted on said mounting plate so as to define an air gap between said heat dissipating fin and the component.

15.(Amended) A surface mountable heat sink and component [as claimed in 14, further comprising:] , comprising:

a substantially planar mounting plate having an outer extent substantially a same shape and dimensions as a footprint of the component, said mounting plate defining opening extending therethrough;

a vertical portion extending at a substantially right angle from said mounting plate, said vertical portion having a first end at said mounting plate and a second end opposite said first end; and

a heat dissipating fin connected to said second end of said vertical portion, said heat dissipating fin having an extent in a direction substantially parallel to said mounting plate and space therefrom, said heat dissipating fin being spaced from the component when the component is mounted on said mounting plate, and

a channel between said mounting plate and said vertical portion, said channel receiving a portion of the component when the component is mounted on said mounting plate.